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THE INDISPENSABLE HONEY BEE

Apicultural Issue

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Guest editor of this issue is *Julia S. Merrill*

Cover photograph by the late *James I. Hambleton*, U.S. Department of Agriculture

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GROWING IN SERVICE

Many of the friends and users of our National Agricultural Library have taken advantage of the opportunities to join with the Associates of the NAL to help our Library. Many useful ideas have been suggested and carried out. Then too, several of the dedicated members of the Library staff have received tokens of appreciation for their efforts.

Recently we have been explaining how more assistance could be provided by the many groups of scholars in the U.S. Department of Agriculture. Dr. Richard A. Farley, the Librarian and his staff would appreciate the advice of such groups, especially in several scientific and economic specialties, on the most important books to acquire for good service to the users of the Library.

We have been thinking of developing advisory groups of experts in each of the scholarly fields to advise Dr. Farley and his staff, in order to shape the collections effectively and to make the wisest use of available funds.

I hope that any readers of this note will cooperate if invited to do so.

Charles E. Kellogg
President

INTRODUCTION

This first Bicentennial Issue of *Associates NAL, Today* is devoted to a phase of agriculture which interests not only beekeepers but farmers, economists, hobbyists, scientists and the general reading public. The indispensable honey bee is of such widespread value and appeal that thousands of books, essays and research papers have been published extolling its virtue and worth.

Since there is so much information to choose from and so many knowledgeable persons to call on, we have, of necessity, limited the material contained here. We have confined ourselves to apicultural matters in the National Capital Area, with special emphasis on Maryland beekeeping, the University of Maryland and Federal research programs.

Julia S. Merrill
Guest Editor

A SPECIAL WELCOME

This issue of *Today* recognizes the literature of Apiculture, an outstanding segment of the collections of the National Agricultural Library. A special welcome and a grateful thank you is extended to Julia S. Merrill of the NAL Library Services Staff, who served ably and cheerfully as guest editor for apicultural material in this issue.



Beginnings . .

The Bee Culture collection was organized in 1925 as a unit of the United States Department of Agriculture Library and placed under the direction of the Bureau of Entomology Branch Library. During the 1940–42 library reorganization program, when the branch libraries were consolidated with the main library, the Apiculture Unit Library was designated as the Bee Culture Branch of the Department Library. It was not until 1975 that the Bee Culture Branch Library was merged with the National Agricultural Library.

The Bee Culture collection is perhaps the largest and most comprehensive collection of bee literature in the United States, if not the world. The collection, for the most part, is concerned with the honey bee, *Apis mellifera* L. but also includes materials on honey production and marketing. It is rich in rare materials – books, periodicals, and pamphlets – both domestic and foreign. A translation file is also part of the collection. An Annotated Beekeeping Bibliography, on cards, begun in 1905, has received world-wide recognition. The Bibliography contains citations to books, pamphlets, and periodicals covering the period 1905–1973 without interruption. This Bibliography together with the very complete apicultural collection comprises a most important and unique source of information on beekeeping.

James I. Hambleton, director of bee culture activities in the Department from 1924 to 1958 was the undisputed organizer and promoter of the Bee Culture Collection. His keen interest and participation in library matters continued into his retirement years. Hambleton had a warm personality and an enthusiasm for his work, which endeared him to the scientific community, scholars, beekeepers, and students all over the world. His death in 1969 brought expressions of admiration, praise, and loss. Ohio State University, his *alma mater*, honored him with the establishment of the James I. Hambleton Award for Student Research Achievement in Agriculture in his memory.*

The actual development of this Branch Library exemplifies a successful cooperative undertaking by the users and the library administration as represented by Hambleton, Claribel Barnett, Department librarian 1907–1940, Mabel Colcord, librarian of the Bureau of Entomology Branch Library, 1915(?)–1942, Ethel L. Coon, Bee Culture Branch librarian from 1924(?)–1944, and Julia S. Merrill, librarian 1944–1973.

As a result of Hambleton's initiative books, pamphlets, and periodicals on beekeeping, filed in the offices of individual scientists and researchers of the Department were assembled, and, through the cooperative expertise of Barnett and Colcord, were processed, cataloged, and merged with the other beekeeping holdings of the Bureau of Entomology Branch Library. From these modest beginnings and subsequent aggressive acquisition policies emerged the Beekeeping Bibliography, a world-renowned information storage and retrieval system on beekeeping.

—Angelina J. Carabelli, Editor

*The award is granted annually to stimulate research in apiculture.



From Johann Jacob Griesingers' *Vollständiges
Bienen = Magazin.* 1796

A SPECIAL BEE LIBRARY AND A SPECIAL BIBLIOGRAPHY

by
Julia S. Merrill
National Agricultural Library
Beltsville, Maryland

This is an account of a library devoted to the subject of beekeeping and of a unique beekeeping bibliography which is of historical as well as current interest.

At its height, the Bee Culture Branch of the National Agricultural Library (NAL), was believed to be the largest and most complete apicultural collection in the United States. It was formed nearly 50 years ago when James I. Hambleton, Chief, Division of Bee Culture, Bureau of Entomology, U.S. Department of Agriculture, brought together the books and periodicals formerly kept in individual offices of the Division. Ethel L. Coon was assigned the task of maintaining and augmenting the collection for the exclusive use of the bee research staff.

At this time, the Division was located in Somerset, Montgomery County, Maryland – just over the District of Columbia line. The library and laboratories moved to the U.S. Agricultural Research Center at Beltsville, Maryland in 1936 and have remained there to this day.

In 1942, the Bee Library, along with other Bureau libraries of the Department of Agriculture, became a part of the Department Library – later the National Agricultural Library (NAL). After several title changes over the years, the bureau library finally became the Bee Culture Branch of the National Agricultural Library and will be referred to as such hereafter.

At one time, some 135 periodicals on bees were received by purchase, gift, or exchange. Most of these were, and still are, published by beekeeper's associations, although in the United States the two major journals are house organs of bee supply houses. In France and Germany, for example, there are numerous associations and many journals – and so it is throughout Europe. The countries of the Far East are also represented in the bee literature received by the library.

The Bee Library collection grew from its humble beginnings to contain over 7,000 bound periodicals and monographs; more than 2,000 reprints from scientific journals not filed in the Bee Library; and several hundred translations and a number of theses in the field of apiculture.

In addition to the most recently published books in the field of apiculture, a number of rare books graced the shelves. Among these were Charles Butler's *Feminine Monarchie*, published in 1632 and John Levet's *The Ordering of Bees*, published in 1634. Other items of historical interest are listed by Alan Fusonic elsewhere in this issue of *NAL TODAY*.

As the Division of Bee Culture grew and the literature became more voluminous, a card index of selected references from the world's bee literature came into being. It is known as the "Beekeeping Bibliography".

The Beekeeping Bibliography is prepared on 5" X 8" cards to allow for the addition of summaries and other pertinent information. The scheme of classification was evolved by the early research staff of the Division and consists of 28 major subject headings and over 200 sub-classes.

The material included in the Bibliography encompasses many fields. Medical, biological, agricultural, and other non-beekeeping periodicals and abstract journals were scanned regularly by the librarian. Articles selected were obtained from the original, if humanly possible, rather than being added unverified.



From The Management of Bees with a Description of the "Ladies' Safety Hive."

The librarians, Ethel L. Coon, and, later, the present writer, were kept informed of the changing interests of the apiculturists, bacteriologists, entomologists, and other scientists employed by the Division of Bee Culture. They were, therefore, able to obtain material of substantial value pertinent to the needs of the workers.

Beekeeping covers a much broader area than honey production and apiary management. The bee business is an essential cog in the agricultural economy of the United States. In this country there are now some

200,000 persons keeping over 4 million colonies of bees. The value of bees for pollination is 20 times as great as for the annual return of honey, which averaged 50 cents for each of the 197 million pounds produced in 1975. In addition to their value to agriculture, bees have provided a source of pleasure and stimulation to the hobbyist, amateur, and back-lot beekeeper.

As field laboratories were added to the Division of Bee Culture, copies of the Bibliography cards were supplied to them on a monthly basis. There are copies of the Bibliography in various stages of completion at former Bee Culture Laboratories at Madison, Wis., Logan, Utah, Laramie, Wyo., Baton Rouge, La. and Tucson, Ariz. Approximately 87,675 cards are in the original Bibliography at Beltsville.

From the Bibliography, information can be located on almost any phase of apiculture. For instance, there are thousands references on bee pollination of plants; many hundreds of references on the toxicity of insecticides to the honey bee; numerous citations on bee behavior, pheromones, royal jelly, bee races, composition of honey, State and Federal regulations on beekeeping, etc.

The Bibliography was maintained by the Branch Library from 1942-1972. It was supported heavily by the Apicultural Research Branch of the Agricultural Research Service. This support included the provision of space, heat and light; the use of machines for copying the bibliography cards; the cost of the cards themselves and, most importantly, the provision of an assistant to the librarian. The assistant was chosen for language ability, essentially, and duties included the preparation of summaries from foreign articles selected by the librarian for inclusion in the bibliography. The last translator to be employed under this contractual agreement was Alfred D. Straughan, who was selected because of his knowledge of German, Spanish, Dutch, and French.

In addition to summaries, Straughan continues to prepare complete translations on demand from U.S.D.A. bee research personnel throughout the country. For many years, translations were exchanged with the Bee Research Association, Chalfont St. Peter, England; Canada Department of Agriculture, Ottawa; and the Bee Department of the University of Guelph, Canada. These translations were listed in *Bee World*, a publication of the internationally known Bee Research Association.

During the more than 75 years that the USDA has done work on bees, the Department research workers have enlarged their sphere of interest from the study of basic bee problems and apiary management to sophisticated bee behavior and an anatomical and physiological studies, and has broadened into the wider areas of research reflected in other articles found in this issue of *NAL TODAY*. Such problems as bee diseases and pollination have always been of concern and continuing work will be done in these and other areas.

In 1972, the Bee Culture Branch Library began a gradual phasing out process, necessitated by the changing emphasis of the National Agricultural Library and the reorganizations within the framework of the Department of Agriculture itself. The Bee Culture librarian, the writer, transferred to NAL in the summer of 1972, but Straughan remained with the bee collection to maintain it, record incoming journals, prepare volumes for the bindery, and to continue the translation service to bee research personnel. Since it was impossible for one person to meet the demands for library service and because of an increasing number of requests for translations, additions to the Beekeeping Bibliography virtually ceased.

In June 1974, the bulk of the apicultural collection was removed to NAL, some 5 miles away. The Bioenvironmental Bee Laboratory, as the Division of Bee Culture is now called, was given the privilege of retaining on indefinite loan, certain publications which the staff requires as aids to research programs.

The Beekeeping Bibliography, an integral part of the Laboratory's resources, was retained at the laboratory. For several years prior to this writer's departure, some consideration had been given to automating or printing the Bibliography, but no firm decision was reached. Now, however, in order to preserve the vast store of information contained in the Bibliography, the Bee Laboratory is filming it in its entirety. Three copies are being made on 16mm film. Two copies will be retained by the Bee Laboratory — one for the current and future use of government bee research personnel and the other to be available for borrowing. The third filmed Beekeeping Bibliography will be



So work the Honey Bees,
Creatures, that by a rule in Nature, teach
The art of order to a peopled Kingdom. — *Shakespeare*

From A Practical Treatise on the Hive and Honey-Bee.

given to NAL, along with the original cardfile bibliography. These will serve research workers, scholars, students and the general beekeeping public as a basis for beginning research in any area of the apicultural discipline.

Though Straughan has been transferred to NAL, the Bioenvironmental Bee Laboratory has, by special contractual agreement, retained his services as a part-time translator and has obtained his assistance in organizing the remaining bee culture collection. This agreement terminates on June 30, 1976. At this time, the final phase of the dissolution of a very special library and a most unique bibliography will be complete. *Requiescant in pace.*

BEE CULTURE IN MARYLAND

by

Dr. Dewey M. Caron
Department of Entomology
University of Maryland

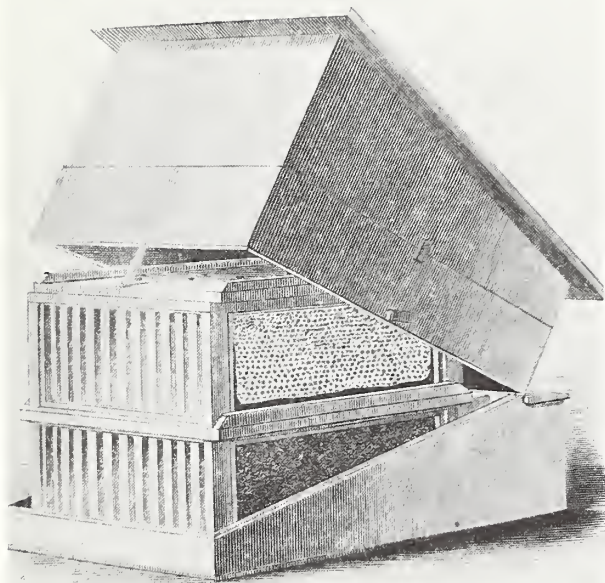
PART I: A GLANCE BACKWARD

It is not possible to pinpoint the exact date honey bees were introduced into Maryland. Honey bees were not native to North America. The colonists introduced honey bees early in their settlement. We have evidence leading us to believe that honey bees were brought to Jamestown, Virginia, in 1621 or 1622 and we know they were in New England in 1638. The first settlement in Maryland was at Clements Island in 1634. This area, where the Potomac River joins the Chesapeake Bay, is nearly identical to Jamestown and honey bees may have been brought to Maryland from Virginia or carried directly to Maryland from England. Undoubtedly, this occurred soon after settlement of Maryland.

Honey bees moved westward with settlement in Maryland as in the rest of North America. The bee colonies were a source of one of the few sweeteners in the early diet. Honey was a valuable and important component of the diet. Sugar, one of the major crops in the Americas, was not available in large quantity for many years and only the very rich could afford it. The abundant flowers of the Mid-Atlantic area yielded rich and flavorful honey.

Our records of beekeeping from the early introduction until the mid 1800's are very limited. Despite disease problems and lack of beekeeping knowledge, beekeeping did continue and some beekeepers were able to harvest honey. The early beekeepers yearly activity with the bee colonies was fairly simple. In the spring, the colonies that survived the winter would increase in size and the bees would swarm. The beekeeper captured these swarms and hived them in wooden boxes and crates and in hollow basswood, maple, and oak log gums. Hopefully, each colony would then store honey during the summer. In the fall, the beekeeper would smoke away or kill the adult bees from a number of these "hives" and rob them of their honey and wax. At harvest time there would be a great feast featuring honey as well as other agricultural crops. Surplus honey would be stored for the winter months. The colonies that weren't killed might be moved to a protected winter location in the woods or near a barn. All surviving colonies would start the cycle anew the next season with the beekeeper using the robbed "hives" to house his or her swarms.

In the last half of the 1800s, great events took place in American beekeeping. In 1851, a minister in Philadelphia, L. L. Langstroth, discovered the principle of the "bee space" and developed a superior movable comb hive which permitted free access to the interior of a bee hive. Honey harvests were taken by adding extra boxes ("supers") above a lower brood rearing area. The colony no longer had to be killed to rob them of their food. The beekeeper only had to examine the hives to insure that there were sufficient winter stores before collecting the "surplus". Improvements in the bee smoker, the honey extractor, and other equip-



Movable Comb Hive, with glass on all sides.

From The Management of bees, with a description of the "Ladies Safety Hive." By Samuel Bagster, Jun. London, 1834.

ment for efficient management of hives and manipulation of the bee population soon followed. Diseases were examined and measures developed to combat the worst of them. Beekeeping became more profitable with the introduction of the Italian bee race in the 1870s; this bee could fight the wax moth, a pest of the hive, and was much more resistant to the diseases that so ravaged earlier attempts at bee culture.

Information on bee culture and training in beekeeping also quickly developed. With the establishment of the Maryland Agricultural College in 1859; one of five faculty positions was that of Professor of Botany, Entymology (sic) and Ornithology. The first instructor was Townsend Glover who also was the first Entomologist in the United States Government. In the earliest years, beekeeping was part of entomology

and was taught as a sophomore subject. In 1880, a new zoology course on "the raising of swine, sheep, poultry, and bees" was added as a senior course. Dr. A. Grabowski taught this course using a well-known beekeeping text by Moses Quimby entitled *Beekeeping*. In 1897, entomology acquired departmental status as the Department of Entomology and Zoology. Beekeeping was taught during some of these years and undoubtedly many of the entomology courses included some beekeeping.

Bee culture in Maryland at the turn of the century was not organized. It consisted, for the most part, of farmers using old-fashioned equipment and primitive management techniques. At the same time, a core of urban sideline and hobby beekeepers practiced modern beekeeping management with modern hives. Nearly every farm had one or more bee colonies. Bee colonies were moved to the many fruit orchards to pollinate apples, pears, and cherries. The urban centers developing in Maryland provided an excellent sales outlet for the Maryland beekeeper.

In 1908, an important event occurred in the development of Maryland bee culture. T. B. Symons, Maryland State Entomologist and a 1903 Maryland Agricultural College graduate, organized the Maryland State Beekeepers Association. He did so with the support of the urban core of beekeepers and some of the more progressive farmers. The first state-wide beekeepers meeting was held December 4, 1908 in the Fifth Regiment Armory in Baltimore. At this historic event, a vice-president was appointed for each Maryland county, a practice continued today by the same Association. The fledgling State Association pressed for state aid for bee culture and for a law to aid in the difficult struggles with bee diseases. Such efforts were partially realized in 1916, when the Maryland State Legislature enacted a law providing for the inspection of apiaries and for the dissemination of information to promote the beekeeping industry. For the next fifteen years, progress was slow.

In 1916, Maryland combined colleges in College Park and Baltimore to create the Maryland State College. At this time, a College of Agriculture was formed which included a Department of Entomology. The name was changed to the Department of Entomology and Bee Culture during the 1920s.

One of the students in the Department of Entomology and Bee Culture was George Abrams. After graduation with an M.S. in 1929, Abrams was appointed the first Extension Apiculture Specialist for Maryland. Active promotion of Maryland honey was begun in the 1930s. Exhibition of honey and bee products was expanded to the state and county fairs. A standard premium list was established for honey. Honey judges were trained. Bee schools taught honey—handling, packaging, and marketing techniques. An important economic study was conducted on the Maryland honey industry during the 1934 to 1937 seasons. Since this time, Maryland honey has not been surpassed in its own markets and the market has remained a strong and excellent one.

In October 1937, Apiary Inspection work officially began in Maryland. The state legislature appropriated \$2000 for this activity and several regional bee inspectors were hired. Due to George Abrams untiring efforts, and those of the Maryland beekeepers, an apiculture building was constructed on the University of Maryland campus. On April 1, 1950, more than 100 persons attended the ground breaking ceremonies for the structure. The apiary building was then, and for many subsequent years, the only building on a college campus in the United States that was devoted entirely to apiculture.

Today, although not a large beekeeping state,



Maryland University beekeeping students learn to make hive bodies – 1910.



From The Bee-keeper's Manual; or Practical Hints on the Management and Complete Preservation of the Honey-bee.

Maryland beekeepers are among the most knowledgeable and best informed in the United States. All beekeepers can sell their honey very readily in the urban areas, and Maryland honey always commands prices well above the national average. There are only a handful of Maryland beekeepers who rely on bee-keeping for their livelihood but several hundred supplement their income with honey and beeswax sales. Over 2,000 hobbyists benefit from beekeeping, harvesting small amounts of honey and large amounts of pleasure. Maryland's fruit and vegetable growers rely completely on the 50 or so beekeepers who rent bee colonies for pollination.

Maryland has a long growing season and a wide variety of honey plants. Prominent among these are tulip poplar, black locust, basswood, sweet clover, blueweed, and wild flowers – especially goldenrod and asters in the fall. It is a good state for beekeeping and with the early tradition of assistance from the Agricultural College continuing today with the University, Maryland beekeepers do as well as, if not better than, beekeepers across the United States. Maryland's bees are busy bees – then as now.

PART II: BEES AND BEEKEEPING AT THE UNIVERSITY OF MARYLAND TODAY

About 1 million honey bees attend the University of Maryland daily. They are part of the 50 bee colonies maintained on the College Park campus to teach students the art and science of beekeeping. The bees live in modern bee hives across from the football stadium among high rise dormitories. Many of the thousands of students who pass the bee hives daily scarcely take notice of the bees' presence. Likewise, with the bees.

The beekeeping efforts at Maryland are directed from the Apiary. In addition to the bee hives, a small Apiary building houses beekeeping equipment; a honey extracting outfit, a modern laboratory, a separate classroom and offices for a secretary, faculty member and students. The Apiary building serves as a hub of activity for the entire state of Maryland.

At the College Park campus, the University of Maryland student can select an introductory beekeeping course and an advanced laboratory course on beekeeping. The introductory course attracts over 200 students each year while the advanced course numbers only about 50 students due to the lack of adequate facilities for a larger number. Introductory Entomology and Economic Entomology courses with annual enrollments over 400 have a lecture and/or lab on bees and beekeeping and frequently use the Apiary facilities for this training. There is one bee oriented course for Maryland graduate students.

The University extends its programs through its Cooperative Extension Service. The Extension beekeeping program includes evening and short courses on beekeeping, a free newsletter, **THE POLLEN BASKET**, and distribution of numerous

bulletins and publications. Best known are the beekeeping courses. Over 400 Marylanders attend a beekeeping course each year. Beginning courses offered at the University Apiary, in Baltimore County and at other locations are most frequently held early in the season to enable newcomers to start the same year. Intermediate and advanced courses are offered during the winter or summer seasons. One day courses cover specialized topics but the basic course covers two days. During the winter the courses are given in 5 or 13-week sessions.

When not in use by students, the University bees serve another important function — research. In addition to formal undergraduate/graduate courses, apicultural training is available for work towards the M.S. and Ph.D. degrees. Degree students use the same bee colonies for their studies. Currently one study involves the pollination of pear trees; cucumber pollination has been studied in the past. The behavior of bees preparing to swarm and the process whereby colonies raise new queens are also under careful scrutiny. The effects harmful pathogens and fly pest exert on the bee colony population also are under study.

Although a fairly recent program, the graduate degree training has already produced 1 Ph.D. and 2 M.S. degrees. The results of these studies are being published in major entomological and apicultural journals. Presently, 1 Ph.D. and 3 M.S. candidates are in various stages of their programs. As these students complete their studies and take positions in various research institutions and academic departments, the University bees cross-pollinate with ideas and training. What better legacy for the lowly worker bee to leave in her short life span of 6 weeks?



Participants in a recent Beekeeping Short Course, photographed before the Apiculture Building at Maryland.



A view from the Stadium – Apiculture Building and bee hives surrounded by high-rise dormitories.

BEEKEEPING COURSES AT LAND-GRANT UNIVERSITIES

Alfred D. Straughan
National Agricultural Library

Land-grant universities are federal-supported institutions, especially known for the unique role they play in agriculture and veterinary medicine. Not only is special provision made for agricultural instruction, but special appropriations are also made for the support of agricultural experimental stations.

The following universities offer courses in apiculture. In the few cases where the courses are taught in other cities, the professors may be contacted by writing in care of the main campus.

Dr. George H. Blake
Auburn University
Auburn, Alabama 36830

Dr. G. D. Waller
University of Arizona
Tucson, Arizona 85721

Phillips Wendal
University of Arkansas, at Bebee
Fayetteville, Arkansas 72701

Dr. Norman Gary
University of California
Davis, California 95616

Dr. J. W. Brewer
Colorado State University
Fort Collins, Colorado 80521

Prof. Alfonse Avitabile
University of Connecticut, at Waterbury
Storrs, Connecticut 06268

Frank Robinson
University of Florida
Gainesville, Florida 32611

Dr. Alfred Dietz
University of Georgia
Athens, Georgia 30601

Dr. Elbert Jaycox
University of Illinois
Urbana, Illinois 61801

Dr. Todd Harris
Purdue University
Lafayette, Indiana 47907

J. W. Stocker, Richmond
University of Kentucky
Lexington, Kentucky 40606

Wm. B. Jordon, Portland
University of Maine
Orono, Maine 04473

Dr. Dewey Caron
University of Maryland
College Park, Maryland 20742

Dr. Henry H. Hagerdorn
University of Massachusetts
Amherst, Massachusetts 01003

Clarence Carlson
Michigan State University
East Lansing, Michigan 48823

Drs. Furgala & Noetzel
University of Minnesota
St. Paul, Minnesota 55101

C. A. Wilson
Mississippi State University
Mississippi State, Mississippi 39762

Dr. Kenneth E. Brown
University of Missouri
Columbia, Missouri 65201

C. J. Walstrom
University of Nebraska
Lincoln, Nebraska 68508

Dr. W. Harold Arnett
University of Nevada
Reno, Nevada 89507

Dr. Radcliffe B. Roberts
Rutgers University
New Brunswick, New Jersey 08901

Dr. Roger A. Morse
Cornell University
Ithaca, New York 14750

Dr. John Ambrose
North Carolina State University
Raleigh, North Carolina 27607

Dr. Walther Rothenbuhler
& L. J. Connor
Ohio State University
Columbus, Ohio 43210

Dr. Don Peters
Oklahoma State University
Stillwater, Oklahoma 74074

Dr. D. M. Burgett
Oregon State University
Corvallis, Oregon 97331

Dr. Robert Berthold
Delaware Valley College
Doylestown, Pennsylvania 18901

Dr. Allen Benton
Pennsylvania State University
University Park, Pennsylvania 16802

Dr. Jaime Moya
University of Puerto Rico, at Mayaguez
Rio Piedras, Puerto Rico 00931

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University of Vermont, at Shelburne
Burlington, Vermont 05401

Dr. Carl A. Johansen
Washington State University
Pullman, Washington 99163

Dr. F. E. Moeller
University of Wisconsin
Madison, Wisconsin 53706

Dr. Wm. T. Wilson
University of Wyoming
Laramie, Wyoming 82070

The beekeeping courses offered at land-grant universities range in length from short courses, often offered in the evening, to full-length, accredited courses, which generally must be taken as part of the regular undergraduate or, to a lesser extent, graduate curriculum. Similarly, the degree of difficulty varies from the more practical instruction of the short and evening courses to the more theoretical, involved courses at college level, and accompanying this is the wide variation in fees charged for the courses. With

the increase in cost of living of the last few years and the drop in college enrollment, the fees charged for university courses have become relatively high. These courses are intended to benefit the hobbyist, who constitutes the majority of beekeepers, the professional, and the specialist. The term professional is used here for the regular beekeeper, while the specialist includes persons prepared for employment in fields related to or serving apiculture.

It is of interest to note that, in the fall of 1975, the Agricultural Technical Institute, part of Ohio State's College of Agriculture, at Wooster, initiated the first 2-year degree program in beekeeping in the United States. The beekeeping technicians who graduate from this program can expect employment in commercial beekeeping firms, honey packing plants, bee supply companies, apiary inspection, research laboratories or can become apiarists on their own.

BRIEF HISTORIC ARTICLES BY NAL USERS

Irvin M. May, Jr., Research Historian, Texas Agricultural Experiment Station, is the author of, "Trailblazing in Agricultural Research" *Texas Agricultural Progress*, vol. 21, no. 4, (Fall, 1975) pp. 3-7.

John R. McGrew of the USDA, Agricultural Research Center, Fruit Laboratory has published a timely article entitled, "Thomas Jefferson Viticulturist and Enophile" *American Wine Society Journal*, vol. 7, no. 4, (Winter, 1975) p. 58.

Wayne D. Rasmussen of the USDA, National Economic Analysis Division recently edited *Agriculture in the United States A Documentary History*, vol. 1-4 (New York: Random House, 1975) 3651 pages; volume one contains an excerpt from "Memorandum in Husbandry on my own Plantation," by William Logan, a tenant of Matthew Potter, near Germantown, Pennsylvania, 1748-58 as well as an excerpt from the "Diary, 1826-1841" of

George Cooke, of Hazelwood, Ellicott City, Maryland. The original manuscripts of both these documents are in the National Agricultural Library. They reflect on farming in Pennsylvania, 1752-1756, and plantation life in Maryland, 1826-1837. This monumental documentary on American agriculture contains additional source material spanning the past through to the present.



From Johann Jacob Griesingers . . .

Vollstandiges Bienen-Magazin.

ETHYLENE OXIDE FUMIGATION FOR THE BEE INDUSTRY

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Over the past decade the Bioenvironmental Bee Laboratory has been studying the value of ethylene oxide in disease prevention and control, especially in regard to American foulbrood disease — probably the most dreaded honey bee disease throughout the world. Previously, in efforts to control the disease, honey bee colonies have been destroyed by burning. However, the financial loss due to burning of the bees and hive equipment is estimated at today's prices as \$100 per colony. Then there is also the value of the honey in the hive. Fumigation is not a new way to salvage bees and hive equipment from diseased colonies, but fumigation appears to be more effective when it is combined with chemotherapy.

The early tests were conducted by constructing fumigation chambers of 6-mil black polyethylene sheets, but these chambers leaked badly, and gas-tight seals could not be constructed. A second introduction of gas compensated for the gas leakage due to poor seals and improved the effectiveness of the polyethylene chamber; recurrence of American foulbrood disease was prevented in 27 of 28 colonies.

Even though the polyethylene chambers could be used successfully, precise controls of temperature and gas levels were lacking. Consequently, the next step was to purchase a permanent, single-wall ethylene oxide fumigation chamber with the necessary controls.

At first the tests were designed to save only the hive equipment. Recently attempts have been made to

save the bees also. The procedure is as follows: bees are shaken off the combs from diseased colonies, held in shipping cages, and fed sugar syrup containing oxytetracycline while the combs are being fumigated with ethylene oxide. Then the combs are decontaminated in an ethylene oxide chamber at a concentration of approximately 600 mg of ethylene oxide/liter and a temperature of approximately 100 degrees F; the 24-hour exposure period is followed by an aeration of equal duration.

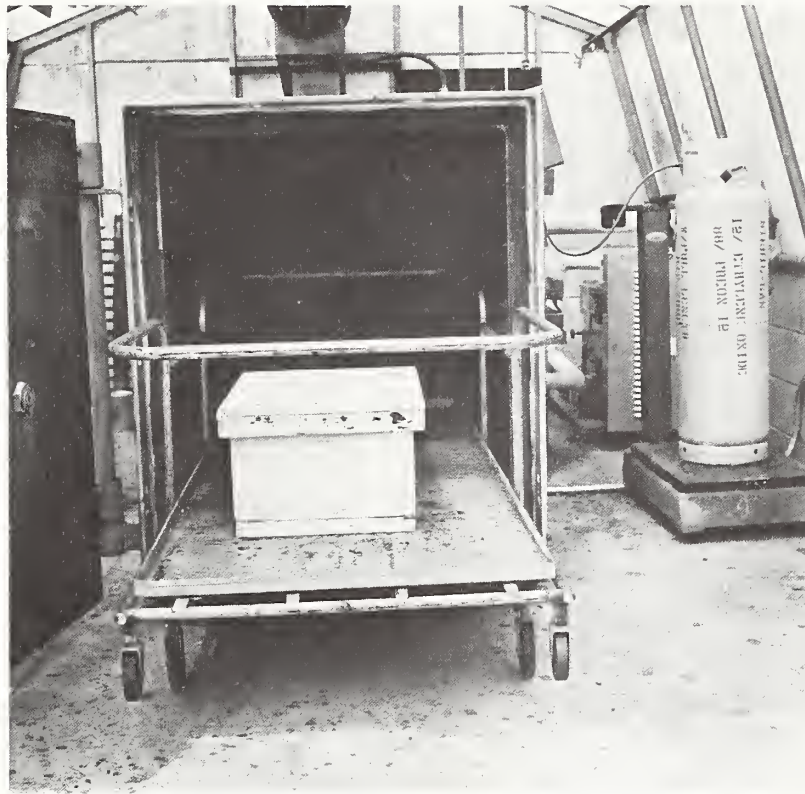
Over the years, ethylene oxide fumigation followed by one feeding of oxytetracycline has prevented recurrence in over 90% of the hives. The bees from the diseased colonies do not carry enough spores to initiate the disease when they are reestablished on fumigated equipment after being held for 24 hours on sugar syrup containing oxytetracycline.

However, in one test, the value of ethylene oxide in disease prevention was also investigated. The test colonies were obtained from a beekeeper who, for the past 10 years, had had an average of 6–10% American foulbrood diseased colonies. Two apiaries were established from these colonies, one treated and one untreated. In the first season, 12.5% of the colonies in the untreated apiary became diseased while none of the fumigated colonies showed any disease during the three year period.

The cost of fumigating an average hive excluding the initial cost of the chamber and labor would be less than \$3, depending on the gas mixture used. A number

of eastern states are conducting tests to determine the feasibility of using ethylene oxide as a routine procedure to eliminate the costly practice of burning or rendering for wax American foulbrood diseased colonies.

Ethylene oxide promises to be a useful tool in combating many diseases and pests. In addition to preventing and controlling American foulbrood, ethylene oxide can be used to control European foulbrood, nosema, and chalk brood diseases. It will also destroy all stages of the greater wax moth, a most destructive pest of honeycombs.



"Ethylene oxide fumigation chamber."

BEE POLLINATION

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Current interest in the quality of the environment is causing us to look more deeply at the factors upon which food production, health and aesthetic aspects of the environment depend. It is also alerting us to the need to conserve resources. Honey bees and many species of wild bees are resources of such great significance to human welfare that we must try to ensure that they will survive in the world of the future to carry on their important work. Problems and dangers confront the long-range survival of wild bees and also the keeping of honey bees as an agricultural enterprise. As human population increases, houses, factories and highways replace open fields of honey and pollen plants. Clean cultivation of farm land and large-scale monoculture reduce the sequence of wild plants needed to provide bee food throughout the season. Pesticides take their toll of wild bees and honey bees. Honey crops are reduced. This presents an impending dilemma, with a reduction of profitable beekeeping and native pollinators on one hand and increased need for bees for crop pollination on the other.

THE VALUE OF POLLINATION BY BEES

At present, in the United States, about 200,000 people keep 5 million colonies of bees and produce about 250 million pounds of honey annually. Recent studies indicate that some 90 crops in the United States depend upon bees, at least to some extent, for pollination. Estimates of the value of bee-pollinated crops vary widely. The value of fruits, vegetables and seed resulting directly from bee pollination plus the value of crops grown from bee-pollinated seed in the

United States total about 8 billion dollars. But the importance of pollination extends beyond the crop resulting directly from pollination. For instance, bee-pollinated alfalfa seed, in itself a valuable commodity, produces hay and pasture which in turn helps produce meat and milk. So pollination is an essential link in a chain of events contributing directly or indirectly to the production of about one-third of our total diet.

BEES AND FLOWERS

There are about 250,000 species of flowering plants on earth, many with an amazing complexity of relationships to bees. Basically, flowers provide nectar and pollen for bees and bees provide cross-pollination for plants. The movement of pollen is as essential to reproduction of most angiosperm plants as mating is for reproduction of most animals. Bees are not the only animal vectors of pollen, but they are the most important. Cross-pollination, the carrying of pollen from one plant to another, provides greater genetic variability in the plant offspring than self-pollination. This means that the plant has greater opportunity to produce mutations, to adapt to new environments, to compete and to occupy new ecological niches.

Mutual dependency has resulted in amazing co-evolution between bees and flowers. Bees have evolved branched hairs to which pollen adheres, intricate pollen baskets on their hind legs, specialized mouthparts and honey sacs for handling

nectar, beeswax honey comb for storing nectar and pollen, specialized behavior for communication etc., all related to their association with angiosperm plants. Plants have evolved flowers to attract cross-pollinating bees and flower mechanisms to prevent self-fertilization. Flowers have color, including a capacity to reflect ultraviolet light, which bees see very well; they have scent, nectar guides, shape and other identifying labels which are assets in competition for pollination services. Plants avoid self-pollination in various well-known ways such as having male and female parts on separate flowers on the same plant or on separate plants or by having morphological or timing barriers to prevent self-pollination.

There are also physiological barriers to self-fertilization. For example, most apple varieties require the pollen of another variety (clone) for successful fertilization. Growers must interplant an orchard with more than one variety, each having compatible pollen, i.e., you cannot plant out an orchard of your favorite variety only. If you do, you won't get a crop. Similar barriers to inbreeding occur in many plants.

The bee fauna of the world is quite large, possibly 15 to 20 thousand species with about 4,000 species and subspecies in the United States and Canada. The best known social bee, the honey bee, *Apis mellifera*, is not a native of this hemisphere but was brought here from Europe by the early settlers. Most species of bees are solitary and do not develop large populations like the honey bee, but in total the solitary bees constitute an enormous pollinating force throughout the world.

PRACTICAL ASPECTS OF POLLINATION

Beekeepers contract with growers for the use of bees to pollinate crops. The beekeeper transports colonies by truck, usually at night, from his permanent apiaries to the crop to be pollinated. The grower pays the beekeeper a rental fee of \$10 to \$20 per colony and some professional beekeepers may move several thousand colonies, often long distances, into the crop. The number of colonies involved may be rather surprising. For instance, California almond growers use over 200,000 colonies of bees during the blossoming period, some of which come from as far away as the state of Washington. All over the country as bee-pollinated crops come into bloom, there is an

annual trek of honey bee colonies to "put the crop on". When the flowers begin to fall, the bees are quickly moved out so the grower can get on with spraying and other chores.

Making the right arrangements for pollinating a crop is not an easy job for the beekeeper. The crop may have rather precise requirements. For instance, it is best to move bees into sweet cherries as soon as bloom starts, but apples do best if the bees are moved in at 25% to 50% bloom. A beekeeper who moves many truckloads of colonies must go all out, day and night, to meet the deadlines, whether moving bees in or out of the crop. Colonies can be lifted onto trucks by hand, but most larger beekeepers now use power equipment to lift colonies, sometimes four at a time on pallets.

The pollination of crops by bees is a very interesting story with too many ramifications to be adequately dealt with in this brief article. There are many hazards and pitfalls for the beekeeper and the grower. The weather may stay cold or windy all through bloom so the bees don't fly; the seed or fruit doesn't form and the crop may be a failure; sometimes bees may be killed by pesticides; and colonies may be stolen --- bee rustling is all too common at present. On the other hand, things may go well, the weather may be bright and clear; the bloom may come out and the bees may do their age-old chore of "putting on the crop".



From William White. *A Complete Guide to the Mystery and Management of Bees.*

HYBRIDIZATION OF HONEY BEES IN SOUTH AMERICA

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INTRODUCTION

There have been numerous popular and technical reports recently about problems caused by hybrid strains of honey bees that have increasingly dominated the honey bee fauna in Brazil since the early 1960s. These reports, though sometimes greatly exaggerated, were stimulated by very real problems that arose from the introduction, hybridization, and spread of a productive, biologically successful, but vicious subspecies of honey bee imported into Brazil from Africa (Araujo 1971, Grout 1968, Nogueira–Neto 1964). There has been some concern in the United States about the possibility that these hybrid (or africanized) bees, with their undesirable characteristics, might disperse to the United States and affect honey bees throughout our country. If the problems encountered in Brazil were to materialize in the United States, there would be a serious impact on our use of bees in crop pollination--a little known but vitally important segment of our agricultural economy. Honey bees contribute to the production of several billion dollars worth of agricultural crops that depend upon or benefit from their pollinating activities.

HISTORY

The introduction of the subspecies of honey bee, *Apis mellifera adansonii*, from Africa into Brazil took place in 1956 (Kerr 1967). W. E. Kerr, University of Sao Paulo, imported about 40 queen bees that he hoped to use to develop a more productive strain of honey bee better adapted to Brazilian conditions than the indigenous strains which had been introduced from Europe many decades before. Through an unfortunate and unpredictable series of events, the bees escaped, increased undetected to a sizable feral population, and then dispersed and eventually "fixed" many of their undesirable and desirable qualities into the resident populations of honey bees, both domesticated and feral.

Concerned beekeepers, entomologists, and other scientists in the United States (McGregor 1970) stimulated the U.S. Department of Agriculture in 1970 to sponsor an investigation of hybrid bees in Brazil by the National Academy of Science–National Research Council. A committee of scientists and beekeepers^{1/} conducted a three–week field survey in Brazil to assess the problem and to estimate its potential impact on the United States. The findings of the Committee appeared in a 1972 report (Anon. 1972) that described the activities of the members and their observations after they examined bees across 30 degree of latitude in Brazil.

The Committee report relates the problems created in Brazil since the introduction of the African subspecies of honey bees. It describes the characteristics, both good and bad, of pure *A. m. adansonii* and its hybrids in Brazil. The impact on beekeeping and agriculture in Brazil, was evaluated, and the anticipated spread and potential impact

in North America discussed. The Committee recommended several possible courses of actions. In response to some of its recommendations, quarantine efforts to prevent accidental or purposeful introduction of the undesirable hybrids have been increased by Animal and Plant Health Inspection Service (APHIS) and a revision of the Honey Bee Importation Act is currently being considered by Congress to broaden and extend the authority to restrict the importation of undesirable germ plasm.

The possibility that bees may be brought or carried into the U.S. is not remote. Plant Protection quarantine records show 43 interceptions of honey bees in international commerce at 14 different ports of entries in the last 5 years. There were probably many other unrecorded interceptions that the inspectors identified only as *Apis* species and did not submit for further identification. Two experimental importations of *A. m. adansonii* semen are known to have been made by scientists since 1960. In both cases the bees were destroyed when their impact on Brazil became known. There is reason to assume that other shipments of queens have been made to the U.S. from Africa over the years (Morse et al. 1973) but no recognizable effect on our bees has been detected. This lack of impact in the past does not eliminate possible danger from future importations.

In response to other recommendations, the Agricultural Research Service (ARS), which has research programs on honey bees at 6 locations in the United States, initiated new studies and redirected some of its resources to projects that will provide information potentially useful in coping with any africanization of bees in North America.



African bees (Apis adansonii) in a docile mood.

A PERSONAL ASSESSMENT

Most of the activity described took place while I served in my former capacity as Chief of the Apiculture Research Branch, Entomology Research Division. My current position on the National Program Staff of ARS keeps me involved in ARS efforts to assess and solve this problem. There was, therefore, a need for a firsthand understanding of the situation in Brazil. In the fall of 1973, I made a trip to South America to discuss the africanized bee problem with scientists, beekeepers, and officials in a number of countries. My purpose was to assess the need for additional efforts on the part of the USDA. For three weeks I traveled in Brazil, Colombia, Panama, Costa Rica, and Mexico City. Government officials in each country communicated to me their ideas and plans regarding the africanized bee. Beekeepers, bee research facilities, and laboratories were visited to determine how their knowledge and resources could contribute to research efforts concerning the africanized bee problem. Also, I had discussions with as many knowledgeable people as possible about their experiences with africanized bees over the last 15 years and visited a number of apiaries to evaluate the current state of the problems caused by africanization.

My findings verified those reported by the Committee after their trip to Brazil two years earlier.

CURRENT IMPACT ON RESIDENT HONEY BEE POPULATIONS

The africanized bees in the southern part of Brazil, from Sao Paulo where they were introduced and south toward Argentina, have changed considerably in behavior and amenability to management during the last 10 years or so. In many apiaries, they seemed to be as easy to handle as any bees we have in the U.S.; in others, heavy smoking of the colony is still required during manipulation, but control is easy to maintain. In addition, the swarming behavior that contributed so strongly to the rapid dispersion of *A. m. adansonii* hybrids is controlled in managed colonies by providing adequate intra-hive space; also absconding during periods of food scarcity is virtually eliminated by feeding and good management. Feral colonies are far fewer now in most of these areas because they have been out-competed by protected

domestic colonies and destroyed by armadillos and other predators. Much of this progress must be credited to the efforts of W. E. Kerr and his associates.

On the other hand, the africanized bees encountered in the northern part of the country, around Recife and Belem, still retain most of the highly undesirable traits that were characteristic of all the bees when they first became widespread in Brazil in the early 1960s. Swarming, absconding, and feral colonies are still problems in those areas.

It is generally accepted in South America that the changes in manageability so widely observed in the southern part of Brazil result from selection pressure by beekeepers. As a result, the bees now are considerably less aggressive than when the africanized bees first spread into the area, though they still present some problems. The superior productivity, however, has been retained. Indeed, visitors from other countries who go to these areas and are shown these improved lines find it hard to believe the extent of the problems that were faced when africanization first occurred. Such visitors frequently return to the United States to report that the whole africanized bee problem is vastly overrated and poses little or no threat to American beekeeping.

The bees that spread north from Sao Paulo have developed very differently. They dispersed into areas where beekeeping was much less developed and where there were fewer colonies, managed less effectively. Those that dispersed widely in the forests were able to retain most of their undesirable characteristics when they supplanted domesticated colonies. Their behavior is still very different from that of the bees I saw in the south. Almost no colonies in the north could be handled without exercising the utmost precautions to reduce vigorous and persistent stinging. The contrast, as noted, is presently attributed largely to good beekeeping management.

The bees that dispersed south entered zones where beekeeping is well-developed, but they also entered a temperate climate. Those that dispersed north are still in a tropical climate. An investigation is currently underway to determine the effect of climate on the africanized bee in Brazil, since climate-related

variations in temper have been observed in Africa.

FUTURE ACTION

The officials in the several Central American countries with whom I discussed the africanized bee are aware of what has happened in Brazil. They are concerned that similar problems might develop in their countries. Also, some bee specialists are developing plans of action. All are most interested in cooperating in plans that may be developed by the United States to prevent or slow down the anticipated northward spread of bees with the undesirable characteristics.

A program to monitor and measure the impact of the northward spread of africanized bees is now under way to determine both the rate of dispersion and its effects on man, and resident populations of honey bees and other pollinators. The 4-year research project is being carried out by scientists of the University of Kansas with ARS support. They have followed the spread of africanization through French Guyana and Surinam.

Research in Brazil is also under way to determine the relative influence of genetics and environment on the marked differences in aggressiveness of the africanized bees in different parts of the country. A study of the factors that affect the behavior and biology of *adansonii* hybrids is also being conducted by Dr. Kerr and his associates (Michener 1974). This research could also have important "spinoff" since there are some highly desirable characteristics of *A. m. adansonii* that contribute to its well-deserved reputation as a superior honey producer. If these can be identified and separated from the undesirable traits, they could be utilized—thus ultimately achieving the purpose for which the bees were first brought to Brazil.

Since selection pressure by a well-developed and expert level of beekeeping management can contribute to increased manageability and decreased aggressiveness of africanized hybrids, the level of beekeeping expertise in northern South America and in Central America should be upgraded.

At the present time, it is difficult to predict how much of a threat the africanized bee poses to the established beekeeping and pollinating industry in the

United States. Through continual monitoring, research, and quarantine efforts, I believe the impact of the bee in the United States probably could be held to a minimum. If undesirable strains are not brought directly into the United States from South America or Africa in large enough quantities so they become established, they can only get here by migrating through Central America. Such natural dispersion would expose the undesirable characteristics to such selection pressure and dilution that, with the help of research and the cooperation of beekeepers in those countries, most of the undesirable characteristics might be eliminated or altered long before the hybrids could reach our country. Also, because of our research programs and the high level of expertise attained by our American beekeepers, we are technically much better able to cope with whatever problems might develop. Most of the United States has a marginal climate for survival; the africanized strains do best in tropical areas. Nevertheless, these strains are very adaptable and can survive, even though they may not thrive, in a wide range of environmental conditions.

Africanization of American honey bees would not mean the end of beekeeping in the United States (such statements have been made). However, there is no question that an extremely unusual biological phenomenon took place in Brazil. Future developments in South and Central America are being watched very closely to minimize any likelihood that North American beekeeping might be exposed to similar biological pollution.

1/ List of Committee members: John Allred, Madera, Calif.; Harold E. Esch, Univ. Notre Dame; Norman E. Gary, Univ. Calif., Davis; Stephen P. Hubbell, Univ. Mich.; Charles D. Michener (Committee Chairman), Univ. Kansas; Walter C. Rothenbuhler, Ohio State Univ.; G. F. Townsend, Univ. Guelph; M. V. Smith, Univ. Guelph; J. Antonio Zozaya, Direccion General de Apicultura y Especies Menores, Mexico City.

SORGHUM AND MILLET INFORMATION

A cooperative one-year project between the National Agricultural Library (NAL) the Agency for International Development (AID) and four land-grant institutions should result in improved information to sorghum and millet researchers. The project evolved out of a Workshop for Development of an International Sorghum Information Network held May 12-13, 1975 in Washington, D.C. (Agricultural Libraries Information Notes 1:6/7, Je/Jl. 75). It will demonstrate and test methods for obtaining a better flow of information among sorghum specialists.

AID has dedicated \$5,900 for partial assistance with service to sorghum and millet researchers and graduate students associated with land-grant institutions in Nebraska, Puerto Rico, Indiana, and Texas. NAL and the land-grant institutions will invest funds and labor in kind. All work will be conducted through the land-grant campus main or branch libraries.

Texas A & M, Purdue, and Nebraska will use the USDA Agricultural Research Service's Current Awareness Literature Service (CAL S). These universities are responsible for drawing up profiles in the online mode and match them for effectiveness, timeliness, and coverage with the CAL S announcements. The Hume Library of the University of Florida is supplying a standard sorghum current awareness profile monthly to the University of Puerto Rico.

Further information on this project is available from Wallace C. Olsen, Liaison Officer, National Agricultural Library, Beltsville, MD (301) 344-3843.

HERITAGE OF APICULTURAL LITERATURE A BIBLIOGRAPHY OF PRE-1870 MONOGRAPHIC IMPRINTS

Compiled by
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INTRODUCTION

The heritage of pre-1870 Apiculture literature is quite substantial. At one time, beekeeping was looked upon favorably as an occupation in such civilized nations as Egypt, Babylon, Assyria and Palestine. It was not until the 16th century however, that beekeeping emerged as an industry. In the published work of Jan Swammerdam, a Dutch naturalist, can be found detailed illustrations of the anatomy of the bee — a contribution which advanced the practice of beekeeping to a more scientific level.

There was some argument as to the origin of the honeybee — that is, whether it came to America along with some of the first colonists or whether there may have been a native species on the Continent. The former seems to be the prevailing view. In this regard, Thomas Jefferson, pointed out in his, *Notes on the State of Virginia*, that the American Indian also concurred with the former view:

The bees have generally extended themselves into the country, a little in advance of the white settlers. The Indian, therefore, called them the white man's fly, and considered their approach as indicating the approach of the settlement of whites.
(*Transactions of The American Philosophical*

Society (1793) 111, p. 243)

In general, beekeeping received its major impetus from Reverend Lorenzo Langstroth's, invention of the moveable-frame hive in 1852, thereby enabling the practice to be a potentially profitable one. As time passed, Langstroth's hive won acceptance in one form or another in many parts of the world. And, as a result, the initial commercial aspects of beekeeping became increasingly more apparent.

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Part of plates are included in paging.
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Includes selections from the following works, each
selection preceded by copy of t.–p. of work from
which it is taken: *Englands Interest . . . 4th ed.*
By Sir J. More, London, 1707: . . . ;
or *The Female Monarchy . . .* By . . . John Thorley.
London, 1744: *Treatise on bees . . .* By
R. Sydserrf. Salisbury, 1792.
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R 424 F76 2 cops.

Johann Jacob Griesingers,
Stadt-Organisten in Münsingen,
vollständiges
Bienen-Magazin,

in welchem
von der Bienenpflege überhaupt, der Bienen natürli-
chen Generation, Ursprung und Präparation ihres Honig- und
Waabenbaues, denen Gebrechen, und was der Bienenzieglung hinderlich
und schädlich, hingegen derselben vorträglich und beförderlich seye; wie
durch Natur gemäße Tractation die sicherste Producta von einer wohlange-
legten Bienenhaltung erlanget werden können, von dem Bienen-
Necht, und dem gesamten Bienenwesen,

wie auch
vom Honig und Wachs, aus eigener und anderer gegründeter
Erfahrung, durch Exempel mit ganz neuen Entdeckungen erläutert,
auf das vollständigste gehandelt wird.

Mit Herzogl. Würtembergl. und Churfürstl. Pfälzischen
Höchstgnädigsten Concession.



Mit vielen Kupfern.

U G M,
bey Albrecht Friederich Bartholomäi. 1769.

Fuckel, Christian Friedrich Ludwig. *Meine Bienenzucht, Oder Ausführliche Anleitung zur Behandlung der Bienen in Jeder Jahreszeit. Mit 6 Figurentafein und Einem Anhang, Nutt's und von Morlot's Bienenzucht Betreffend. Zweite Verbesserte und Vermehrte Auflage.* Darmstadt: Carl Wilhelm Leske, 1846. 4 p. 1, xvi, 303 p., 1 l., fold., pl. (5)
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Gedde, John. *The English Apiary: or, The Compleat Bee-master. Unfolding the Whole Art and Mystery of the Management of Bees. Being a Collection and Improvement of What Has Been Written by All Authors, Relating to This Subject, as Well Antient as Modern. With a New Discovery of an Excellent Method for Making Bee-houses and Colonies, to Free the Owners from the Great Charge and Trouble That Attends the Swarming of Bees, and Is Much More Advantageous Than Any Method Hitherto Practised.* London: E. Curll, W. Mears, and T. Corbet, 1721. v–ix, (15) 108 p., front.

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Harbison, W C. *Bees and Bee-Keeping: A Plain, Practical Work; Resulting from Years of Experience and Close Observation in Extensive Apiaries, both in Pennsylvania and California. With directions How to Make Bee-Keeping a Desirable and Lucrative Business, and for Shipping Bees to California.* New York: C. M. Saxton, Barker & Co., 1860. x, (11)–288 p., illus.
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Hermann, H C. *Die Italienische Alpenbiene oder Die Goldgrube der Landwirthschaft. Kurze und Praktische Anleitung, um sich Fruchtbare Achte Italiener Koniginnen zu Erziehen, in Wenigen Monaten zu Verhundertfaltigen und Deutsche Bienenstocke in Italiienische Umzuwandeln.* Chur, (n. p.), 1859.
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Hirsch, Johann Christoph. *Der frankische Bienen-meister, oder Grundliche Nachricht von der Bienenzucht/samt Einem Vorbericht von Denen Ehmahligen Zeidel-gerichten, aus denen Bewahrtesten Schriften und Eigener Erfahrung, dem Landmann zum Besten, in Druck Gegeben, mit Kupfern von Hof-, Crammer – und Landschafts-rath Johann Christoph Hirsch.* Anspach, 1767.
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The Hive and Its Wonders. Written for the American Sunday-school Union. Philadelphia: American Sunday-school union (1851)
126 p., front., illus.
R 424 H64

Hoffler, Caspar. *M. Caspar Hofflers Rechte Bienen-kunst, aus Nicolai Jacobi Schlesiens Tractat, und Eigener Erfahrung, in Drey Bucher Zusammen Geschrieben, mit Schonen Kunststucken und Figuren Gezieret, Woraus ein Fleissiger Haus-vater Grundlich Erlernen Kan, Wie er eine Bienenzucht Anlegen, Solche in Person Wohl Abwarten, und Fruchtbarch Geniessen Komme; Anietzo Aber in Richtigcre Ordnung Verfasset, in Vielen Merklick Vermehret und Verbessert. Durch M. Christoph Schrot.* Leipzig: In Verlag Friedrich Lanckischens Erben, 1741.
14 p. 1., 446 (i.e. 346), (6) p., fold., front.
Page 346 incorrectly numbered 446.
R 424 H672

Hoffler, Caspar. *M. Caspar Hoflers Vollstandige Anweisung zur Bienenzucht, Nebst Allen Hieher Gehorigen Kunstgriffen, Anmerkungen, und den Beygefugten Betrachtungen uber die bienen des Herrn Maraldi. 6. und Vermehrte Auflage.* Leipzig: Bey Friedrich Lanckischens Erben, 1753.
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Huber, Francois. *Fragments d'Hubert sur les Abeilles, Avec une Preface et une Introduction par M. le D Mayranx.* Paris: Bureau de la Bibliotheque Choisie, 1829.
xii, 322 p., 4 p. (Half-title: Bibliotheque Choisie par une Societe de Gens de Lettres, Sons la Direction de M. Laurentie. I Section.
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R 424 H860 1806

- . *New Observations on the Natural History of Bees*, by Francis Huber. Translated from the original. 2d ed. Edinburgh: J. Anderson; London: Longman, Hurst, Rees, and Orme, 1808. xxv, 314 p., fold., front.
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- . *New Observations on the Natural History of Bees*. By Francis Huber. 3rd ed. Edinburgh: W. & C. Tait; London: Longman, Hurst, Rees, Orme, and Brown, 1821. 2 p. 1., (vii)—xv, 440 p., fold., pl. (5)
- . *Observations on the Natural History of Bees*. By Francis Huber. A New Edition, with a Memoir of the Author, Practical Appendix, and Analytical Index. London: Thomas Tegg, 1841. 4 p. 1., (iii)—xxiv, 352 p., fold., pl. (5)
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- Huish, Robert. *Bees: Their Natural History and General Management: Comprising A Full and Experimental Examination of the Various Systems of Native and Foreign Apiarians; With an Analytical Exposition of the Errors of the Theory of Huber; Containing, Also, The Latest Discoveries & Improvements in Every Department of the Apiary, With a Description of the Most Approved Hives Now in Use*. London: Sherwood, Gilbert, and Piper, 1842. xxvii, (9)—458 p., 20 p., front., port.; illus.
R 424 H87BE 1842
- . New edition, greatly enlarged. London: Henry G. Bohn, 1844. xxvii, (9)—458, 2 p., front., port., illus.
R 424 H87Be
- . *A Treatise on the Nature, Economy, and Practical Management, of Bees; In Which the Various Systems of the British and Foreign Apiarians Are Examined, and the Most Improved Methods Laid Down for Effectually Preserving the Lives of the Bees. Containing also, An Accurate Description, Illustrated by Plates, of The Hives, Invented by Lombard, Ducouedic, Huber, L'Abbe Della Rocca, and other foreign apiarians; And of a Newly Invented Hive, for the Purpose of Depriving the Bees of Their Honey, with Safety and Expedition: Forming the Most Complete Guide to the Study and Management of Those Valuable Insects*. London: Baldwin, Cradock, and Joy, 1815. xxiii, (1) 414 p., 6 pl. (1 fold.)
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R 424 K15

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R 424 K52

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R 424 K52 1796

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R 424 K52T

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R 424 K54

—————. *Secrets of Bee-keeping. Being a Practical Treatise in Every Department of Bee Culture & Bee Management Embracing the Natural History of the Bee, From the Earliest Period of the World Down to the Present Time. Giving the Anatomy and Physiology of the Different Species that Constitute a Colony. &c., &c.*
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R 424 W492

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2nd identical copy has third edition revised for author.

R 424 L26H 1859

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xii, (13)—412, (8) p., front., illus., pl. (24)

R 424 L26H 1860

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R 424 M36

Melicher, Ludwig Josef. *Die Bienenzucht in der Weltausstellung zu Paris 1867, und Die Bienencultur in Frankreich und in der Schweiz.* Wien: Wilhelm Braumuller, 1868.
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Mills, John. *An Essay on the Management of Bees. Wherein Is Shewn The Method of Rearing Those Useful Insects; and that the Practice of Saving Their Lives When Their Honey and Wax Are Taken from Them Was Known to the Antients, and Is, in Itself, Simple and Easily Executed.* London: J. Johnson and B. Davenport, 1766.
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R 424 M66 Ed. 2

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Milano: Dalla Tipografia di Gio. Silvestri, 1845.

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R 424 N31

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R424 N31 Ed. 2

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R 424 N96H

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xxii, 269 p., front., illus., pl. (1 fold.)

R 424 N96H Ed. 2

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xxx, 281 p. front., illus., pl. (1 fold.)

424 N96H Ed. 4

Fifth Edition, Revised, Enlarged, and Edited by the Rev. Thomas Clark. Wisbech: Printed by John Leach; London: Longman and Co.; New York: J. Sholl, 1839.

xxx, 281 p., fold., front., pl. (2 fold., incl. front.)

R 424 N96H Ed. 5

Sixth Edition, Revised, Enlarged, and Edited by the Rev. Thomas Clark. Wisbech: John Leach; London: Longman and Co.; New York: J. Sholl, 1845.

xxxiv, 306 p., illus., pl. (2 fold. incl. front.)

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Oettl, J(ohann) N(epomuk). *Klaus de Bienenvater Aus Bohmen.* (2, Aufl.) (Saaz): Schonfeld, 1853.

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R 424 P452

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14 p. 1., 130, (2) p., pl. (1 fold.)
R 424 P65

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R 424 P97

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R 424 Q4B 1853

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R 424 Q4B 1858

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R 424 R11 Ed. 3

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R 424 R24

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R 424 R39 1847

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R 424 R44

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156 p. pl.
R 424 R55

Comprenant: 1. *L'Histoire Naturelle de Ces Insectes, Leur Curieux Trauvaux & Leur Admirable Instinct;* 2. *La Construction d'une Ruche a Etages, dans Laguelle, par des Recoltes d'Ete, On Peut se Procurer du Miel Parfaitement Blanc;* 3. *La Maniere de Gouvenmer les Ruches, & les Soins a Donner aux Abeilles Durant le Cours de l'Annee, Suivie du Calendrier de l'Apiculteur;* 4. *La Manipulation d l'Usage du Miel & de la Cire.*

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Rusden, Moses. *A Further Discovery of Bees. Treating of the Nature, Government, Generation & Preservation of the Bee. With the Experiments and Improvements Arising from the Keeping Them in Transparent Boxes, Instead of Straw-hives. Also Proper Directions (to All Such as Keep Bees) as Well to Prevent Their Robbing in Straw-hives, as Their Killing in the Colonies.* London: n.p., 1679.
143 p.
R 424 R892

Sagot, l'Abbe. *Petit Traite Special de la Culture des Abeilles avec l'Aumoniere Ruche a Cadres et Greniers Mobiles.* Paris: Simon Racon et Co., (1860's).
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R 424 C98B

Samuelson, James. *The Honey-bee; Its Natural History, Habits, Anatomy, and Microscopical Beauties.* By James Samuelson, Assisted by J. Braxton Hicks. Also Two Chapters on Instinct and Reason; Being an Introduction to the Study of Comparative Psychology, by the same author. London: John Van Voorst, 1860.
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R 424 Sa4

- Sartori, Luigi. *Trattato di Apiculture Razionale, di Luigi Sartori di Primiero*. Vicenza: Tip. Nazionale Paroni, 1866.
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- Savani, Luigi. *Modo Pratico per Conservare le Api e per Estrarre il Mele Senza Ucciderle dell'Avvocato Luigi Savani*. Milano: Dalla Tipografia di Gioranni Silvestri, 1811.
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R 424 Sa9
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- Serain, Pierre Eutrope. *Instruction sur la Maniere de Gouverner les Abeilles; Ouvrage qui a Obtenu le Premier Accessit de la Societe d'Agriculture du Departement de la Seine, dans sa Seance Publique du 30 Fructidor an 9*. Paris: A. J. Marchant; Samson, 1802.
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- Sielhold, Carl Theodor Ernst von. *On a True Parthenogenesis in Moths and Bees; A Contribution to the History of Reproduction in Animals*. Translated by William S. Dallas. London: John Van Voorst, 1857.
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- Smith, Jerome Van Crowninshield. *An Essay on the Practicability of Cultivating the Honey Bee, in Maritime Towns and Cities, as a Source of Domestic Economy and Profit*. By Jerome V. C. Smith, M.D. Boston, Perkins and Marvin; New York: J. Leavitt, 1831.
/ 9/ – 106 p. incl. front., illus.
424 Sm62
- Spitzner, Johann Ernst. *M. Johann Ernst Spitzner's . . . Ausfuhrliche Theoretische und Braktische Beschreibung der Korbbienenzucht, nach Ausgemachten Grunden der Naturlehre und Langer eigener Erfahrung*. Hrsg. von Friedrich Pohl Leipzig: J. C. Hinrichsche, 1823.
xxiv, 327, /1/ p. III pl.
424 Sp4 Ed. 3
- Kritische Geschichte der Meinungen von dem Geschlechte der Bienen, von der Begattung und Befruchtung der Konigin, der Erzeugung der Verschiedenen Arten und Andern Merkwurdigkeiten in der Bienenrepublik*.
Leipzig: Johann Gottlob Feind, 1795.
2 v. in 1. 326 p., 1 fold., pl.
R 424 Sp4K
- Sprenger, Balthasar. *Einleitung in die Neuere Bienenzucht Nach ihren Grunden*. Stuttgart: Johann Benedict Mezlern 1773.
294 p.
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Taylor, Henry. *The Bee-keeper's Manual; or Practical Hints on the Management and Complete Preservation of the Honey-bee*. 2d edition, enlarged, and with additional illustrations. London: R. Groombridge, 1839.
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R 424 T21 Ed. 3

London: Groombridge and Sons, 1850.
viii, 184 p., front., illus.
R 424 T21 Ed. 4

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424 T21 Ed. 5

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Thacher, James. *A Practical Treatise on the Management of Bees, and the Establishment of Apiaries, with the Best Method of Destroying and Preventing the Depredations of the Bee Moth*. Boston: Marsh & Capen, 1829.
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Thorley, John. *An Enquiry into the Nature, Order, and Government of Bees, Those Instructive and Useful Insects. With a New, Easy, and Effectual Method to Preserve Them, Not Only in Colonies, But Common Hives. A Secret Unknown to Past Ages, and Now Published for the Benefit of Mankind*. London: J. Waugh, 1765.
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Bound with 2d ed.
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_____ . *Melisselogia. Or, The Female Monarchy. Being an Enquiry into the Nature, Order and Government of Bees, Those Admirable, Instructive, and Useful Insects. With a New, Easy, and Effectual Method to Preserve Them, Not Only in Colonies, but Common Hives, from that Cruel Death, to Which Their Ignorant, Injurious, and Most Ingrateful Owners So Commonly Condemn Them. A Secret Unknown to Past Ages and Now Published for the Benefit of Mankind. Written Upon Forty Years Observation and Experience*. Illustrated with Copper-Plates. London: N. Thorley, 1744.
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Townley, Edward. *A Practical Treatise on Humanity to Honey Bees; or, Practical Directions for the Management of Honey Bees, upon an Improved and Humane Plan, by Which the Lives of Bees May Be Preserved and Abundance of Honey of a Superior Quality Obtained*. New York: William S. Dorr, 1843.
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Varani, Antonio. *Utilissimo Metodo di Custodire le Api Ricavando da Loro la Maggiore Utilita Possibile col Preservarle in Vita Ogni Anno Levando Dagli Alveari la Cera ed il Mele*. dato in luce. Verona: Per gli Eredi Carattoni Stamp. Vescovili, 1793.
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(1860)
15 p.
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Vogel, Friedrich Wilhelm. *Handbuch der Bienenzucht Oder Vollstandige Anleitung zur Naturgemass-rationellen und Eintraglichen Pflege der Honigbiene in Allen Praktischen Stockformen*. Berlin: E. Schotte & Co., 1867.
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Wallbrecht, Ch. *Die Bienenwirthschaft. Ein Handbuch zur Forderung der Neuesten Zuchtmethode Mit Beruksichtigung der Verschiedenen Betriebsweisen als: Schwarm-, Zeidel-, Garten- und Wander-bienenzucht Nach den Besten Hulfsquellen und den Neuesten Erfahrungen Fur Angehende Bienenfreunde Bearbeitet. Zweite, Ganz Umgearbeitete und Vielfach Vermehrte Auflage*. Gottingen: Vandenhoeck und Ruprechts, 1860.
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Warder, Joseph. *The True Amazons: or, The Monarchy of Bees: Being a New Discovery and Improvement of Those Wonderful Creatures. Wherein Is Experimentally Demonstrated. I. That They Are All Governed by a Queen. II. The Amazing Beauty and Dignity of Her Person. III. Her Extraordinary Authority and Power. IV. Their Exceeding Loyalty and Unparalleled Love to Their Queen. V. Their Sex, Male and Female. VI. The Manner of Their Breeding. VII. Their Wars. VIII. Their Enemies, With Directions Plain and Easy How to Manage Them, Both in Straw-hives and Transparent Boxes; So That with Laying Out but Four or Five Pounds, in Three or Four Years If the Summers Are Kind, You May Get Thirty or Forty Pounds Per Annum. Also How to Make the English Wine or Mead, Equal, If not Superior to the Best of Other Wines*. London: I. Dawks, 1712.
xii, (4), 166 p.
R 424 W21

3d edition with additions. London: John Pemberton, William Taylor, 1716.
xiii, (2) p., 120 p., illus.
R 424 W21 Ed. 3

Seventh edition. London: T. Longman, T. Astley, 1742.
7 p., (13)-164 p., front. (port.), illus.
R 424 W21 Ed. 7

Eighth edition. London: T. Longman, T. Astley, 1749.
8, (13)-164, (4) p., front. (port.) diagr.
R 424 W21 Ed. 8

Ninth edition. London: R. Baldwin and T. Longman, 1765.
8, (13)-164, (4) p., front. (port.) diagr.
R 424 W21 Ed. 9

Weeks, John M(oseley). *A Manual: or An Easy Method of Managing Bees, in the Most Profitable Manner to Their Owner, with Infallible Rules to Prevent Their Destruction by the Moth*. Middlebury, (Vt.): Knapp and Jewett, 1836.
73 p.
R 424 W41

Third edition. Middlebury, (Vt.): Hamilton Drury, 1838.
93 p.
R 424 W41 Ed. 3

Fourth edition. Brandon: Vermont Telegram Office, 1839.
96 p.
R 424 W41 Ed. 4

New edition revised and enlarged. Boston: Weeks, Jordan & Co., 1840.
iv p., 1 1., 128 p.
R 424 W41 1840

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Werner, Dieterich. *Anleitung zur Bienen-zucht.*
Hannover: In der Forsterischen Buchhandlung,
1766.

6 p., 112 p., (2) p.

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R 424 W492

Werner, Johann Ernst. *Handbuch zur Einfachsten
Behandlung der Bienen Nach den Neuesten
Grundsätzen und Erfahrungen für den Land-
lichen Hausvater in Diskursen Abgefast und
Herausgegeben.* Leipzig und Gera:

Wilhelm Heinsius, 1795.

6 p. 1, 136 p.

R 424 W49

White, Stephen. *Collateral Bee-boxes: or, A
New, Easy, and Advantageous Method of
Managing Bees. In Which Part of the Honey
is Taken Away, in an Easy and Pleasant
Manner, without Destroying, or Much
Disturbing the Bees; and Early Swarms are
Encouraged.* The third edition, improved.

London: L. Davis, C. Reymers, 1764.

1 p. 1., ix, 47 p., front.

R 424 W584

White, William. *A Complete Guide to the
Mystery and Management of Bees. Containing
Instructions How to Manage Them with
Respect to Their Breeding, Gathering,
Swarming, Hiving, Feeding, &c. to
Considerable Advantage: Also, Directions
Whereby the Governor or Queen-bee May be
Distinctly Known; Together with Several
Curious Matters Concerning Them Deduced
Chiefly from Experience. Being the Most
Valuable Discovery Hereto Found Out.*

London: The author (1771).

xvi, 94 p., 1 1., front.

R 424 W58

Wighton, John. *The History and Management
of Bees, with Notice of a Newly-constructed
Hive.* London: Longman and Co.; Norwich:
Bacon, Kinnebrook, and Bacon, 1842.

2 p. 1., xii, 103, (1) p., front., illus.

R 424 W63

Wildman, Daniel. *A Complete Guide for the
Management of Bees Throughout the Year.
Containing 1. A Description of the New-invented
Hives, and the Manner of Using Them, So As to
Take the Honey and Wax without Destroying the
Bees. 2. Description of the New-invented
Bee-house, and Its Properest Situation. 3. The
Proper Method of Swarming and Hiving Bees.
4. Of Separating the Honey from the Wax. 5. Of
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Diseases to Which Bees Are Subject, and Their
Remedies. 7. Of the Queen Bee, Working Bee,
and Drone. 8. Of the Generation of Bees. 9.
Directions to Make Mead.* The Third Edition,
with Additions. Illustrated with Copper-plates.
London: the author, 1780.

vii, 9-48 p., 2 fold. front.

R 424 W643 Ed. 3

The Eleventh Edition with Additions.

Illustrated with Copper-plates. London: the
author, 1780.

vii, 9-48 p., 2 fold. front.

R 424 W643 Ed. 11

The Sixteenth Edition, with Additions.
Illustrated with Copper-plates. London:
T. Jones, 1802.

viii, 9-48 p. 2 fold. front.

R 424 W643 Ed. 16

Wildman, Thomas. *A Treatise on the Management
of Bees; Added the Natural History of Wasps and
Hornets, and the Means of Destroying Them.*
London: Cadell, 1768.

(1), xix, (1), 189, (7) pp., fold., plates.

R 424 W642

*A Treatise on the Management
of Bees; Wherein Is Contained The Natural
History of Those Insects; With the Various
Methods of Cultivating Them, Both Ancient
and Modern, and the Improved Treatment of
Them. To Which Is Added, The Natural
History of Wasps and Hornets, and the Means
of Destroying Them.* 2nd edition. London:
W. Strahan; T. Cadell, 1770.

xvii, 3, (1)-311, (7) p., Appendix (1)-16 p.
pl. (3 fold.)

R 424 W642 Ed. 2

Third edition. London: W. Strahan; T. Cadell, 1778.

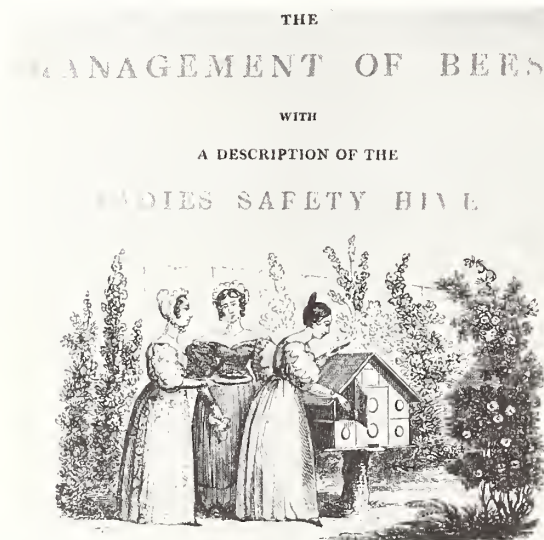
xvii, 3, (1)–318, (7) p., Appendix (1)–16, (2) p., pl. (3 fold.)

R 424 W642 Ed. 3

Wurster, S(imeon) F(riedrich). *Vollständige Anleitung zu Einer Nutzlichen und Dauerhaften Magazin–Bienenzucht.* Tubingen: Jacob Friederich Heerbrandt, 1790.

lvi, 520 p., 2 p., 6 fold., pl.

R 424 W96



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NEW ENGLAND MICROFILMING PROJECT COMPLETED

A major accomplishment in the microfilming of research publications has been achieved with the completion of a project involving the state land–grant publications of six New England states. (Agricultural Libraries Information Notes 1:11, Nov. 75). The cooperating states are Connecticut, New Hampshire, Maine, Massachusetts, Rhode Island, and Vermont. The documents filmed include those of the agricultural experiment stations, extension services, colleges of agriculture, forestry and home economics. Prime emphasis was given to filming long serial runs of those

organizational units from their inception through 1969. A total of 340,000 pages of publications for the New England states have been filmed producing 182 rolls of films. However, not every title from the land–grant agricultural publications of these states has been filmed. Broken and difficult to complete sets were excluded in many cases.

The film is for sale by Graphic Microfilm, Inc., 1560 Trapelo Road, Waltham, Massachusetts, 02154. Available film includes 16 mm reduced by special photographic technique from the 35 mm film. It will be available in regular as well as cassette cartridges. Individual titles as well as sets will be sold for any of the six states.



NAL HAPPENINGS

CAIN ONLINE COURSE OFFERING

From May 10-14, the National Agricultural Library will be sponsoring a workshop to train librarians and information specialists in the utilization of its CAIN bibliographic data base in an online mode. The course will be held at the Steenbock Library, University of Wisconsin, Madison.

WORLD OF CAIN

Following the American Society for Information Science (ASIS) Bicentennial Conference on April 14-16, a CAIN data base seminar will be held at the Sheraton Park Hotel in Washington, D. C. The purpose of this seminar is to train CAIN data base users and relate CAIN use to available software vendors. The CAIN training session will be lead by a team consisting of Ronald J. Walton, Head, Computer Applications, Mr. Charles Bebee, Head, Reference, Mr. Harry Kemp, Reference, and Mrs. Maydelle Stewart, Indexing.

NAL ACCEPTS HISTORICAL RECORDS

On October 3, 1975, Dr. Richard Farley, Director of the National Agricultural Library, and Mr. Early W. McMunn, Director of Public Affairs for the Harvest Publishing Company and Chairman of the American Agricultural Editors Association History Committee, signed an "Instrument of Gift" donating the historical records of the Association to the National Agricultural Library. On February 4, 1976 records relating to the Association's activities 1964-1970 arrived at the Library. Earl McMunn has contracted appropriate officials of the Association and additional materials are anticipated. Once processed, these materials will provide an added dimension to the Library as a research institution.

A FOREIGN VISITOR TO NAL

Early in January, Mr. D. B. Eswara Reddy, Librarian, Andhra Pradesh Agricultural University, Hyderabad, India, visited the Library. Mr. Reddy, upon his return to India, will be responsible for establishing at the University a central library collections for the state of Andhra Pradesh. During his visit to NAL, he observed operations in both technical and public service areas. Arrangements, were also made for him to acquire selected publications for the University Library.

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